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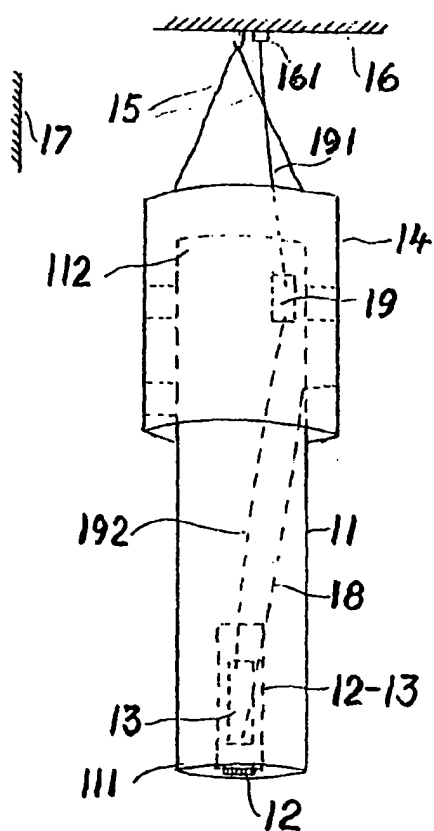
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[Continued on next page]

(54) Title: AN AIR CLEANER



(57) Abstract: An air cleaner comprising an electron generator (12-13) that includes a pointed head (12), a collector element (14) and an electric circuit (13) included in the electronic generator (12-13) for generating a negative potential on the pointed head (12) and a positive potential on the collector element (14). The pointed head (12) is mounted at the free end (111) of a cylinder (11) comprised of electrically non-conductive (insulating) material. The cylinder (11) includes the electric circuit (13) at one end whereas its remaining end (112) enters the collector element (14), which is cylindrical and comprised of electrically conductive material.

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Declaration under Rule 4.17:

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AN AIR CLEANER

TECHNICAL FIELD

5 The present invention relates to an electronic air cleaner of the kind that includes an electron generator that has a pointed head, a collector element, and an electric circuit included in the electronic generator for generating a negative potential on the pointed head and a positive potential on the collector element.

DESCRIPTION OF THE BACKGROUND ART

15 An air cleaner of the aforesaid kind is apparent, for instance, from Swedish Patent Specification 512 282. In the case of the air cleaner illustrated in this prior publication, the pointed head is disposed so as to point out towards the centre of the space in which air shall be cleaned. Moreover, the collector element is comprised of a plate which is positioned so that the pointed head will be directed away from the plate, which has a surface area of at least 150 cm² and a convex shape as seen from the pointed head.

20 Although this air cleaner has been found to fulfil high demands on the cleaning of air in a space in practice, customers have found it somewhat difficult to position the cleaner in rooms of different kinds and configurations as a result of its design. One object of the present invention is to eliminate this drawback.

SUMMARY OF THE INVENTION

25 According to the present invention, the pointed head of an air cleaner of the aforescribed kind is mounted on the free end of a cylinder comprised of electrically non-conducting material, wherein said cylinder includes the electric circuit and the collector element is included in its remaining end, said element being cylindrical in shape and comprised of
30 electrically conductive material.

BRIEF DESCRIPTION OF THE DRAWING

The invention will now be described in more detail with reference to the accompanying drawing, which illustrates examples of embodiments according to the invention, wherein

- 5 Fig. 1 illustrates an embodiment for suspension from a ceiling;
 Fig. 2 illustrates an embodiment for placement on a table or floor; and
 Fig. 3 is a view from above of an alternative embodiment of a collector included in an inventive air cleaner.

10 DESCRIPTION OF A PREFERRED EMBODIMENT

The air cleaner illustrated in Fig. 1 includes an electron generator 12-13 that has a pointed head 12, a collector element 14, and an electric circuit 14 included in the electron generator 12-13 for generating a negative potential on the pointed head 12, via a short conductor, and
 15 a positive potential on the collector element 14, via a conductor 18.

The pointed head 12, which is comprised of corona points (carbon fibre bristles), (alternatively special steel needles), is mounted on the free end 111 of a cylinder 11 comprised of an insulating material, e.g. ABS plastic. The cylinder 11 includes said
 20 electric circuit 13 at one end thereof whereas the other end 112 extends fully or partially through the collector element 14, which is cylindrical and open both at its top and bottom and comprised of electrically conductive material, e.g. aluminium. In the illustrated embodiment, the collector element 14 has an all-round and double-sided collector function (inwards and outwards). The cylinder 11 is held centred in the collector element 14 by
 25 means of spacers on the inner wall of said collector element. (By cylindrical is not necessarily meant a circular-cylinder, but a shape that occurs when a straight generatrix is displaced parallel along a closed path).

The air cleaner can be hung by a suspension device 15 from a ceiling 16 for example,
 30 alternatively with a line fastened in the cylinder 112. The shortest distance to the ceiling 16 and to a wall 17 should be at least 20 cm. The distance between the collector element 14 and the pointed head 12 will preferably be at least 12 cm and at most 300 cm.

The air cleaner may be powered from the mains (220 volts) via a ceiling-mounted electric fitting 161 and conductor 191 leading to an adapter (transformer) 19, (alternatively fastened to the ceiling or to a fixed mains connection in the wall), which converts the mains voltage to a low-voltage DC voltage (12 volts). This is delivered via a conductor 192
 5 to the electron generator 12-13, which produces an extremely high DC voltage of very low current, about 5 pA.

The air cleaner illustrated in Fig. 2 is principally of the same construction as that shown in Fig. 1, comprising cylinder 11, pointed head 12 and collector element 14. However, the
 10 components are placed in reverse in this case, so that the pointed head 12 faces upwards. Furthermore, the air cleaner includes a foot 21-22, which can be placed freely on a floor (or a table). The foot 21-22 consists of an outwardly extended plastic part 21 of the cylinder 11 and an iron foot plate 22 (alternatively a foot plate comprised of acrylic resin) fastened to the lower end of the part 21.

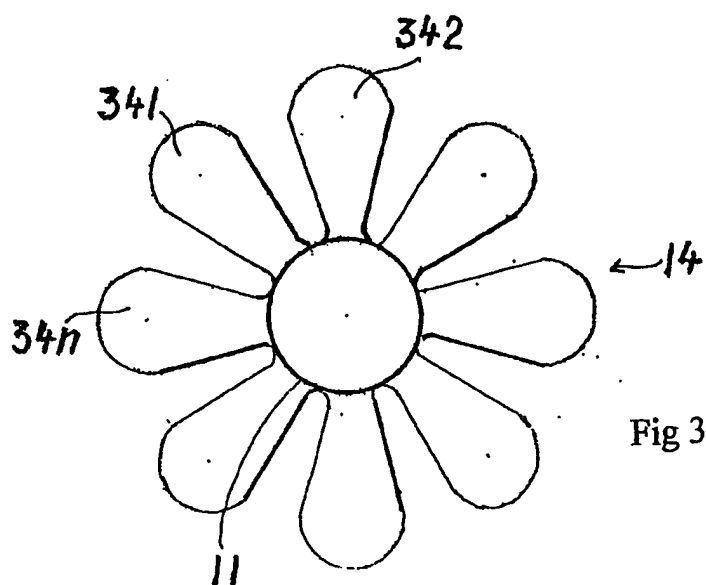
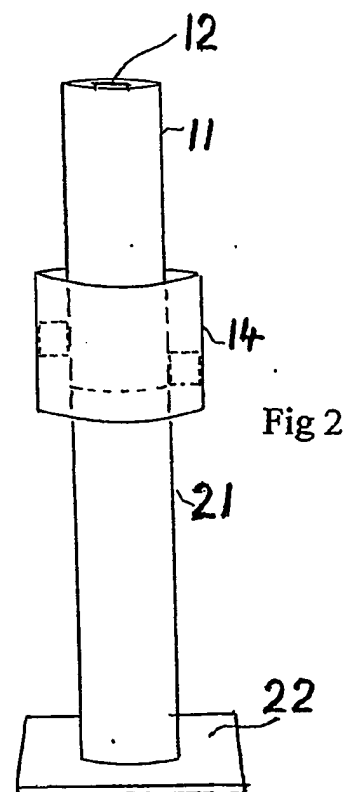
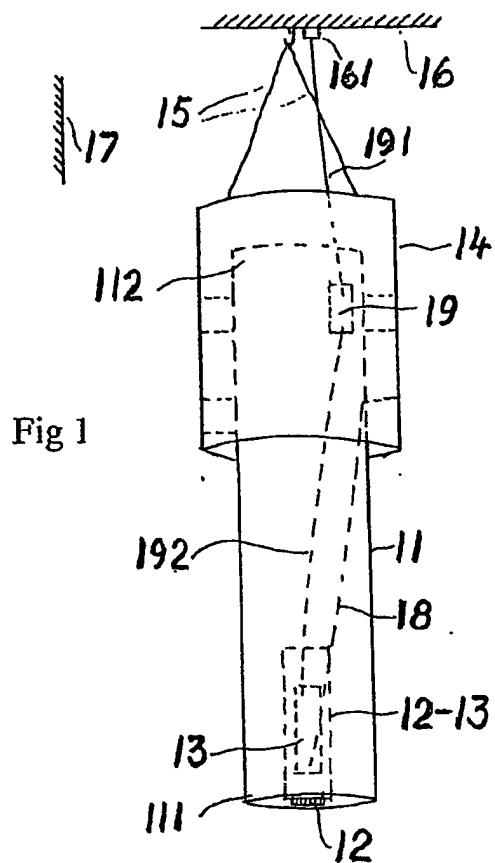
15 The alternative embodiment of the collector 14 shown from above in Fig. 3 includes a number of mutually identical bulges 341, 342, ... 34n around the cylinder 11. These bulges have softly or gently rounded transitions so as to avoid the point effect.

20 The described inventive air cleaner differs from other, conventional air cleaners by virtue of the following properties, among other things:

- as an electronic air cleaner/ioniser; does not create static fields;
- functions in the absence of movable parts (e.g. fans/blowers);
- also collects ultrafine particles (smaller than 0.1 μm) in the absence of expensive
 25 filters; and is
- energy-lean, silent and draught-free.

CLAIM

4. An air cleaner comprising an electron generator (12-13) that includes a pointed head (12), a collector element (14) and an electric circuit (13) included in the electronic generator
5 (12-13) for generating a negative potential on the pointed head (12) and a positive potential on the collector element (14), characterised in that
the pointed head (12) is mounted at the free end (111) of a cylinder (11) comprised of electrically non-conductive (insulating) material; and in that
the cylinder (11) includes the electric circuit (13) at one end whereas its remaining end
10 (112) passes into the collector element (14), which is cylindrical and comprised of electrically conductive material.



INTERNATIONAL SEARCH REPORT

International application No.

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A. CLASSIFICATION OF SUBJECT MATTER

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According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: B03C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|-----------|---|-----------------------|
| A | EP 0281414 A1 (NEC AUTOMATION LIMITED), 7 Sept 1988 (07.09.88), column 3, line 23 - line 34; column 5, line 3 - line 5, figures 5-7,13, claim 7 -- | 1 |
| A | US 4496375 A (LE VANTINE), 29 January 1985 (29.01.85), figure 5, abstract -- ----- | 1 |

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents

"A" document defining the general state of the art which is not considered to be of particular relevance

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INTERNATIONAL SEARCH REPORT
Information on patent family members

30/09/02

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| Patent document cited in search report | | | Publication date | Patent family member(s) | | Publication date |
|---|---------|----|---------------------|----------------------------|-----------|---------------------|
| EP | 0281414 | A1 | 07/09/88 | US | 4790861 A | 13/12/88 |
| | | | | JP | 1031939 A | 02/02/89 |
| | | | | JP | 1821915 C | 10/02/94 |
| | | | | JP | 5033290 B | 19/05/93 |
| | | | | US | 4828165 A | 09/05/89 |
| ----- | | | | | | |
| US | 4496375 | A | 29/01/85 | NONE | | |
| ----- | | | | | | |